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Quarterly Newsletter
of the Chennai Snake Park Trust

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Cover

Banded kukri (*Oligodon arnensis*)

Kukri snakes are named after their sharp curved teeth. The species is widespread in India and often mistaken for krait due to its banded pattern.

Photo : **A. Karuppaiya**

To wonder is to begin to understand

Cobra invites articles and short notes on reptiles and amphibians, their ecology, biology, natural history, conservation or other aspects. These may be of scientific or popular interest. Black and white photographs are also welcome.

Please send your contributions to the Editor, *Cobra*, Chennai Snake Park Trust, Rajbhavan Post, Chennai 600 022.

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Calling behavior and courtship of *Hoplobatrachus tigerinus* Daudin

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Calling is a highly versatile aspect of social behaviour in most of the male aunurans highlighting species identity, sex, location and nuptial preparation (Duellman, 1967; Wiewandt, 1969; Allan, 1973; Bunnell, 1973; Whitney and Krebs, 1979; Wells, 1977,1978,1979,1980; Gerhardt, 1978; Pyburn, 1978 and Mallick, 1990). A plethora of excellent investigations like Martof and Thompson, 1958; Littlejohn and Michaud, 1959; Blair and Littlejohn,1960; Littlejohn *et. al.*, 1960; Littlejohn,1961; Littlejohn and Loftus-Hills,1968, Schimidt, 1969 and 1971, Gerhardt, 1973, Littlejhon and Watson, 1974 and Mallick, 1990 establishes undoubtedly that such calls attract females amongst other things.

Anuran courtship is an obvious event during reproduction. Information on the Indian anuran courtship is meagre (Mallick, 1986,1988 & 1997). The present paper discusses the calling and courtship of *Hoplobatrachus tigerinus* Daudin.

Methods

As many as 25 territorial breeding sites were regularly visited from 1994 to 1997, from dusk through midnight, during the advanced monsoon period from the middle of May to the end of July, to study the nature of calling and courtship of *H. tigerinus*. Study area was about 1km in diameter and situated in the village- Duillya, in Howrah district, West Bengal, India. A tape recorder was used to record the calls of the species. The recording was monitored systematically to note the response of the species.

Results

Hoplobatrachus tigerinus like many other ranids is nocturnal in sexual habits and exhibits temporal type of breeding preferring temporary pools to permanent waterbodies, noticeably shallow ditches and ponds (Mallick, 1992). Both sexes were found to squat near water in territorial breeding sites and the males were calling characteristically from the beginning to the termination of calling which was followed by axillary amplexus. The courtship of as many as 27 cases in all territorial breeding sites was analysed as under.

Calling behaviour: *H.tigerinus* was found to exhibit four call types (I-IV), viz., 'starting', 'advertisment', 'encounter'and 'mating calls'. Calling started at ambient temperature ranging from 28° to 32°c mostly at dusk or later after a shower. One of the territorial males opened a single note call of one to two seconds with a short pitch quickly followed by other males in the same breeding ground.

The type-II call representing the 'advertisement call' of high pitch, with one to two notes of two to three seconds duration started immediately after the conclusion of the type-I call. The intermittent nature of the call continued for several hours. The interval between the two successive calls were irregular. Males of a particular territorial breeding site may resort to a chorus or they may start calling separately. The chorus of one territorial male influenced those of neighbouring territorial breeding sites to become vocal spontaneously. However, some of the males directly responded to type-II call without announcing the 'starting call'/type-I call. The advertisement call, interestingly enough, has two-fold functions of announcing one's position to the other and inviting attention of expectant females. Playback of this type-II call influenced the territorial males, who quickly responded.

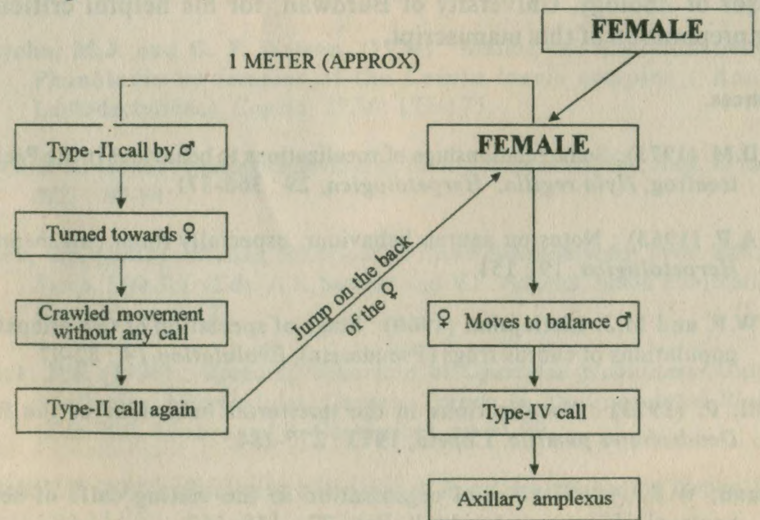
Type-III call, the 'encounter call', is of deep and low pitch of single note of two to three seconds duration & subserves as warning by the resident male(s) to the intruders from the same or different territory. When type-II call recorded in one territorial breeding site was replayed in another, positive results, of calling were noted. Some of the resident males responded and resorted to the type-II call and those near the playing tape recorder raised type-III encounter call to warn.

The type-IV call, 'mating call' is due to its long frequency with deep and multiple notes, distorted, by the juxtaposition and depression of inflated vocal sacs, pressed against the female's back, appearing as a guttural voice which ceases as soon as they are locked into axillary amplexus. The radius of audibility is about a meter around the pair.

Courtship : As the sequence of courtship in all the cases was of the same nature, for convenience, the chronology of events in one pair has been cited as typical for this species.

The behavioural pattern was visualised and analysed as soon as an expectant female was approached by a resident calling male. The type-II call won the female's attention. She interrupted her movement about a meter away from the male who ceased calling and took a sharp espeditious turn towards the approaching female. Thereafter the male crawled over 15 cms, stopped and resumed type-II call transiently for four to seven seconds. The male suddenly jumped over the immobile female. The female balances the impact by laterally moving her body thereby preventing the dislodging of the male, who emitted the type-IV call as a mark of ectasy. Shortly after the type-IV call had terminated, the pairing partners became locked into axillary amplexus (Fig.1).

Fig.1 Diagramatic representation of courtship of *Hoplobatrachus tigerinus* Daudin.



Discussion :

The period of breeding for 2-3 months characterises *Rana clamitans* (Wells, 1977), *Rana catesbeiana* (Blair, 1963; Emlen, 1968), *Rana limnocharis* (Mallick, 1986), *Rana cyanophlyctis* (Mallick, 1988) and *Hoplobatrachus tigerinus.* In contrast it may be as high as 9 months in *Rana captio* (Wright and Wright, 1949).

Investigators probing into anuran reproductive behaviour have categorically pointed to thedifferent distinct calls correlating with the corresponding behavioural patterns in different species. The present author has noted four discrete types of calls in *H. tigerinus* as in *Rana clamitans* (Wells, 1978), both differing from *Colostethus inguinalis* (Wells 1980). Like *H. tigerinus* the male's recourse to sharp turn has also been found in *Hyla cinerea* (Garton and Brandon 1975), *Rana cyanophlyctis* (Mallick 1988) and *Bufo melanostictus* (Mallick 1997).

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Fear is the key

Sometime back I recalled my learning about animal behaviour and decided to experiment with the element of "fear" as I approached the unexpected rhesus expectantly peering to catch a glimpse of my folded fists behind my back, probably waiting for a morsel or two. On nearing the enclosure, I deliberately revealed to it, what I had in my hand - a hyperactive striped keelback. The monkey was definitely taken by surprise and with a shriek, bounded as far away as possible from that writhing creature. It was a typical intuitive recoil mechanism, a "fight or flee" reaction. In the case of humans any stick or stone would have been conveniently converted into an instrument of death and the poor reptile would have been pulverized, till each and every cell in its system ceased all biological activities. Besides this innate fear we owe our stringent dislike towards snakes, due to unfounded myths and superstitious beliefs ingrained in us through "grandmother tales".

Snakes have been portrayed as devil incarnate or creatures of ominous significance, through our traditional ties with an animistic culture and kept alive by popular cinema, gossip mongers, quacks and the ubiquitous snake charmer. As we progress towards a world of cybernetics and plastic money, the rest of the western world even today inadvertently depicts India as a land of tigers, mysticism, snakes and snake charmers. Having worked in a snake park, it is my experience that snakes, particularly venomous snakes, are defanged brutally by snake charmers for the sake of performance, the only act by which they earn their daily bread.

The snake people

In fact snake charming is an ancient profession. These snake charmers are directly responsible for the death of snakes. Defanged snakes live for a couple of months on the average, being kept alive by force feeding them on a diet of boiled eggs. A new reptile replaces the old each time one dies. Nearly sixty to seventy thousand snakes die on each Nagapanchami day. Popular resorts and fancy ethnic hotels catering to a foreign clientele encourages snake charmers to put up their acts.

The professional snake catchers and charmers are Irulas of Tamil Nadu, Mahrs of Maharashtra and Saperas of north India. The Kerhas a nomadic tribe who speak a mixture of Bengali and Oriya live in a commune called Padmakesaripur which also shelters thousands of snakes of different species. Two villages in the country, namely Patia near Bhubaneshwar in Orissa and Agra in Uttar Pradesh are exclusive to snake charmers. The art of capturing, handling and keeping snakes is passed on to successive generation.

Despite enforcement of the Indian Wildlife (Protection) Act, capture and trade in snakes and snake skins do continue. This can be confirmed when one takes a stroll down New Delhi's fashionable Janpath area, where curio shops nonchalantly display snake skin products, such as belts, wallets, purses etc.. The raw material is procured by the middle men from professional catchers for a paltry sum. By the time the finished goods reach the retailers it may be priced three hundred times more.

During the course of my work in the northeastern parts of the country, I happened to meet a snake charmer at Moran. Incidentally, I was in charge of conducting an environmental education training programme for primary school teachers, when I decided to borrow a couple of snakes from these snake charmers for the purpose of an impromtu snake show. My main aim was to demonstrate, employing the commonly found reptiles for the purpose of highlighting some of the issue concerning reptile conservation and biology. The live cobras, of course defanged, did create an impact amongst

the audience, while the unamused snake charmer sedately sat watching the whole proceeding, with much boredom. After thanking him and tipping the fellow a decent amount, I tried my best to explain the purpose behind such a snake show and the need to put into perspective the ecological role of snakes and thereby emphasising on conservation measures. To my utter surprise, the snake charmer though being an illiterate was able to recall a number of species, referring to them by their local names, their habitats and habits including the type of reaction expected from different venomous species. In other words, I had found a very able resource person for a snake awareness programme. Finally, he flatly declined that idea of working in the field of environmental education even if there happened to be some kind of remuneration. The basis of his argument centred on the fact that their lot is illiterate and economically deprived and certain trade secrets could be exploited in the guise of social aid.

Duty without cruelty

This experience led me to search for such snake charmers with traditional knowledge in places like Ahmedabad, Bhubaneshwar, Lucknow, Gorakhpur, Guwahati and Madras. During interaction with snake charmers, the key question would be, why don't they give up this practice, which of course was met with a standard reply of, what other occupation would they be involved in. A general survey of specimens in the custody of snake charmers revealed commonality in exhibit material - the defanged cobra and the docile rat snake. Some snake charmers had other specimens such as the rock python, red sand boa or common sand boa. These were considered as standard wares of the snake charmer. While a few also exhibited trinket, green vine snake, banded racer and diadem snake all of which are inoffensive creatures. On one occasion in Orissa a snake charmer had in position a king cobra and a couple of banded kraits, probably de-fanged. None of the vipers were found in custody of the snake charmers. The outcome of the interactions with snake charmers convinced me that, they could be a vital tool in promoting snake awareness and conservation if they are trained and provided with incentives. In which case this idea may have to be recognized as an important initiative by government

agencies, particularly the Ministry of Environment and Forests. Such an initiative has already been proved to be workable by the Irula Snake Catchers' Cooperative at Mahabalipuram, Tamil Nadu. The expertise of the snake charmer can be utilised in many positive ways. For instance, biological control of rodents in granaries or capture of snakes for zoos and reptile parks and also assisting herpetologists in their field studies. If such activities are suitably rewarded, snake charmers may become stake holders in conservation.

Rehabilitation of snake charmers may seem to be a gargantuan task and the question of some of them reverting to their age old profession is a sure possibility. But such a step would definitely curb trends in snake skin trade and remove unwanted myths regarding snakes. In this process the various snake and reptile parks should play concerted roles in taking into confidence the local snake charmers, by involving them in public awareness programmes, venom extraction, pest control and rescue of snakes from domestic situation. Define a role for the local snake charmer in such activities and appreciate his contribution as well as support these activities by means of payments. At the same time enhance the snake charmers traditional knowledge with scientific approaches, especially in handling and keeping snakes. Dissuade them from practising defanging venomous snakes, advice them to keep their own rattery as a source of food for the captive snakes. At the same time, negotiate with local voluntary organizations to provide health and hygiene services including education for the families of snake charmers. As a begining, if the kind of activities as suggested are tried out, may be experimentally to demonstrate a model, it would prove as an example to illustrate the workablity of such a scheme and convince governmental agencies to lend support to the overall drive in the rehabilitation of snake charmers. Who knows, one day snake charmers may have their own column in the yellow pages, besides snakes being the friends of the charmers.

Food preference in captivity among selected frogs and toads

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Providing captive animals with an appropriate and balanced diet should be the ultimate goal in zoo nutrition (Courts, 1995). Ultimately a better understanding of quantitative and qualitative aspects of nutrition in animals held in captivity is a prerequisite for their successful conservation and propagation (Ganslober, *et al* 1995). Therefore it is important, in captivity, to provide better psychological health, opportunities for natural behaviour and breeding of an animal. It is also necessary to establish feeding programmes for each amphibian species on the basis of field studies. At Coimbatore Zoo a food selection study on 20 amphibian species was conducted during January 1997 to March 1998. To meet the demands of frogs and toads, at the site live house crickets (*Acheta domestica*) were also reared in insect culture cages.

The diet chart for frogs and toads were made on the basis of composition of their diet in wild as well as on the basis of food availability at the site. All frogs and toads were fed in the evening hours. No difficulty was faced except with a few cases which took a short acclimatization period to adjust to the captive environment.

It was felt important to provide Vitamin D3 and calcium to captive frogs and toads, which are required for a number of metabolic functions and are important for the formation of skeletal system of young frogs. They also permit females frogs to produce eggs (Gupta,1998). As suggested, Vitamin D3 supplements may be sprinkled on invertebrate food items before offering to frogs (Anonymous, 1989). During the present study all captive frogs and toads were fed with nutritional supplements as they played an important role in preventing nutritional deficiencies of animals. Following is the summary of the food offered and preference shown by frogs and toads :

Family Bufonidae

1. Bufo melanostictus

Composition of diet in wild: termites, ants and mosquitoes, cockroaches beetles, earthworms and spiders (Deuti and Goswami, 1995).
Food offered in captivity: grasshoppers (*Cyrtacanthacris ranacea* and *Tryxalis turrita*), house crickets (*Acheta domestica*) and *Gryllus sp*., snails (*Cryptozona semirugata*), termites, earthworms and millipedes.
Food preferred:
I. House crickets (*Acheta domestica*)
II. Grasshoppers (*Cyrtacanthacris ranacea*)
III. Termites

2. Bufo beddomei

Composition of diet in wild : not known
Food offered in captivity: termites, ants, young crickets and young grasshoppers.
Food preferred:
I. termites
II. ants
III. Crickets

3. Bufo parietalis

Composition of diet in wild: termites and cockroaches (pers. observ.)
Food offered in captivity: termites, crickets, grasshoppers, earth worms and snails.
Food preferred:
I. ants
II. termites
III. crickets

4. Bufo fergusoni

Composition of diet in wild: termites (Daniel,1963)
Food offered in captivity: termites, ants, crickets and grasshoppers
Food preferred:
I. ants
II. termites
III. crickets

Family Microhylidae

1. Microhyla rubra

Composition of diet in wild: beetles (Das,1996)
Food offered in captivity : termites, ants, crickets and grasshoppers
Food preferred :
I. beetles
II. termites
III. ants

2. Uperodon systoma

Composition of diet in wild : termites and ants (Das, 1996)
Food offered in captivity : termites, white ants and insect larvae.
Food preferred :
I. termites
II. insect larvae

Family Ranidae

1. *Euphlyctis cyanoplyctis*

Composition of diet in wild: aquatic insects, beetles, mollusc, fish, tadpoles, dipterans, orthopterans (Das, 1996) and hemipterans (Das pers. comm.).
Food offered in captivity : fish, crickets and grasshoppers.
Food preferred:
I. aquatic insects
II. fish
III.tadpoles

2. *Euphlyctis hexadactylus*

Composition of diet in wild: leaf fragments of *Ceratophyllum demersum*, algae *Oedogonium* sp, *Zygnema sp.*, Mollusca: snails, Arthropoda: Odonata, Hemiptera, Formicidae, Coleoptera, Diptera, Blattodea, Chordata: Fish, Amphibians (frogs & tadpoles), fish excreta and reptiles (*Hemidactylus sp.*) (Das, 1995b; Deuti and Goswami, 1995).
Food offered in captivity: fish, grasshoppers (*Tryxalis turrita*), earthworms, snail (*Cryptozona semirugata, Cryptozona balangeri*), floating plants *Nymphaea sp*,, house crickets (*Acheta domestica*), spiders and millipedes.
Food preferred:
I. fish
II. floating plants *Nymphaea sp.*
III. grasshoppers (*Tryxalis turrita*)
On one occasion a adult frog was observed feeding on a green keelback snake (*Macropisthodon plumbicolor*)

3. *Hoplobatrachus crassus*

Composition of diet in wild: Termites, fish (Das, 1996), grasshoppers, mole-crickets, beetles, earthworms, snails, blades of grass (Deuti and Goswami,1995), crustaceans, tadpoles and rarely ants (I.Das pers. comm.).
Food offered in captivity: fish, grasshoppers (*Tryxalis turrita*), earthworms, snails (*Cryptozona semirugata, Cryptozona balangeri*), house

crickets (*Acheta domestica*), spiders, beetle (*Acanthophorus seraticornis*)*, *Gryllus sp.* and millipedes.
Food preferred:
I. snails (*Cryptozona semirugata, Cryptozona balangeri)*
II. fish
III. beetles (*Acanthophorus seraticornis*)*

4. *Hoplobatrachus tigerinus*

Composition of diet in wild: spiders, land crabs, earthworms, centipedes, caterpillars, scorpions, small fishes, mice, squirrel, geckos, lizards, skinks, small birds and water snakes (Deuti and Goswami, 1995)
Food offered in captivity: House crickets (*Acheta domestica*), *Gryllus sp.*, earthworms, millipedes, grasshoppers and small fish.
Food preferred:
I. crickets
II. earthworms
III. millipedes

5. *Indirana beddomei*

Composition of diet in wild: not known
Food offered in captivity: termites, ants and young house crickets.
Food preferred:
I. termites
II. crickets
III. house crickets

6. *Indirana semipalmata*

Composition of diet in wild: not known
Food offered in captivity: termites and young crickets.
Food preferred:
I. termites
II. crickets

7. Indirana brachytarsus

Composition of diet in wild: not known
Food offered in captivity: termites, crickets, and grasshoppers .
Food preferred:
I. termites
II. young crickets

8. Indirana leptodactyla

Composition of diet in wild: not known
Food offered in captivity: termites, ants, crickets and grasshoppers
Food preferred:
I. white ants
II. young crickets

9. Limnonectes keralensis

Composition of diet in wild: grasshoppers, moths, cockroaches, termites, catepillars, earthworms (Deuti and Goswami, 1995; Daniels, 1992) and insect larvae (I.Das pers. comm.).
Food offered in captivity: earthworms, grasshoppers (*Cyrtacanthacris ranacea*), termites, house crickets (*Acheta domestica*), and *Gryllus sp*.
Food preferred:
I. grasshoppers (*Cyrtacanthacris ranacea*)
II. earth worms
III. termites

During this study several observations were made on verrucose frog consuming earthworm of 5" in length, in a span of 8-10 minutes.

10. Limnoectes limnocharis

Composition of diet in wild: small beetles, ants, termites , insect larvae and spiders (Deuti and Goswami,1995).
Food offered in captivity: beetles (*Acanthophorus seraticornis*)*, house crickets (*Acheta domestica*), spiders and white ants.

Food preferred:
I. termites
II. beetles (*Acanthophorus seraticornis*)*
III. house crickets

11. Nyctibatrachus major

Composition of diet in wild: small soft bodied insects (Ranjit Daniels pers. comm.)
Food offered in captivity: termites, insect larvae, spiders and fish.
Food preferred:
I. termites
II.insect larvae

12. Rana temporalis

Composition of diet in wild: *R. limnocharis*, dipterans (stalk eyed flies), spiders, cockroaches and termites (Das, 1995a).
Food offered in captivity: grasshoppers *(Cyrtacanthacris ranacea)*, beetles, termites, crickets, earthworms and ants.
Food freferred:
I. grasshoppers *(Cyrtacanthacris ranacea)*
II. house crickets (*Acheta domestica)*
III. termites

13. Tomopterna breviceps

Composition of diet in wild: winged termites, ants, wasps, grasshoppers, cockroaches, spiders (Deuti and Goswami, 1995; I.Das pers. comm.).
Food offered in captivity: beetles, termites, crickets and grasshoppers *(Cyrtacanthacris ranacea)*.
Food preferred:
I. termites
II. beetles

14. Tomopterna rolandae

Composition of diet in wild: beetles (Das,1996).
Food offered in captivity: white ants, crickets, grasshoppers and beetles.
Food preferred:

I. beetles
II. termites
III. crickets

I. High preference II. Medium preference III. Low preference

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* This is a very large beetle; seems like an erroneous identification — Editor.

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Foraging and Basking Ecology of Fresh Water Turtle, *Kachuga smithi* (Gray) Inhabiting Northern India.

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Serious attention has been paid towards the biology of other Indian reptiles but no such attention has been given to explore the ecology of fresh water turtles in Indian habitats (Yadav, 1983). Studies on the different aspects of ecology and feeding strategies are highly important while thinking of their conservation possibilities. The fresh water turtles inhabiting the United States are comparatively better studied and also well documented than the turtles of any other part of the world (Ernst,1976; Plummer, 1975&1977; Mahmoud and Klicka,1979). Therefore, the present work on the foraging and basking ecology was carried out which was totally lacking earlier.

Materials and Methods

The whole stretch of Ghaghra river system of Faizabad district in eastern UP was selected for making the exploration on foraging and basking ecology of *Kachuga smithi*. Observations were made regularly by being very close to the turtles in their main habitat, river banks and also while basking, during two years i.e.1989 and 1990. The data obtained were analysed.

Observations

During the course of study i.e. 1989 and 1990, it was found that the fresh water turtle, *Kachuga smithi* inhabits the entire Ghaghra river system of Faizabad district preferably in the main running current. During the

rainy season the animals graze upon the grasses and often basks nearby after emerging from their abode as per investigation (Table-1 & 2). The specimens were also seen in the stagnant water pockets of the river system. The emergence of the turtles was subject to local variations in the environmental conditions such as light, temperature & availability of food, geographically, seasonally and diurnally.

The vegetation specially of grasses was very rich during the rainy season which comprised of *Cynodon dactylon, Paspalum sp., Digitaria adscendens, Cyprus rotrundus, Eleusine indica* and *Eragrostis uniloides*, etc. Simultaneously, the dense vegetation also provides a very efficient safety measure for the foraging and basking turtles. Incidentally, this vegetation is practically almost nil during summer i.e. May and June which results in very negligible emergence of the turtles from their abode. During such circumstances, the turtles shift their time for foraging and basking which happens either to be early in morning or late in the evening when there is considerable rise in day temperature. The other important ecological behaviour, hibernation was not evident in the case of *Kachuga smithi*. It is important to point out that the flexible neck and structure of jaws very much suit the grazing and swallowing of grasses, smaller fishes, fingerlings, molluscs etc.

Discussion

By and large, the turtles in general are adapted to an aquatic mode of life through many ecological and morphological specialisations (Zangerl,1969; Walker, 1973). Significant differences in the seasonal and diurnal activity of turtles reported elsewhere was observed in the case of *Kachuga smithi* (Ernst,1976; Plummer,1977; Tinkle, 1961; Moll and Legler, 1971). Most of the turtles are diurnally active as it was well noticed in the spresent study (Carr, 1952; Moorehouse,1933). The effect of temperature on the activity and feeding ecology have been well observed by me (unpublished) and well documented by Plummer (1977), Legler (1973), White and Murphy (1973), Plummer and Shirrer (1975). To conclude, it can be clearly stated that the foraging and feeding ecology of *Kachuga smithi* follows almost the similar ecological, foraging and feeding behavioural pattern as evident in most of the fresh water turtles (Yadav,1983).

TABLE 1:

The number of foraging and basking turtles, *Kachuga smithi* (Gray) observed at different hours during different months of the year 1989.

Time (Hrs.)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
08.00	2	6	10	13	20	18	24	26	18	17	10	6
09.00	3	5	11	15	21	20	18	22	16	16	18	4
10.00	3	3	10	14	20	21	20	16	16	18	6	4
11.00	2	3	10	14	22	22	22	16	17	17	4	3
12.00	3	3	9	16	18	10	12	17	10	10	4	3
13.00	2	5	9	16	18	10	12	17	10	10	4	3
14.00	5	10	10	18	19	10	8	18	10	8	2	2
15.00	15	12	15	20	20	8	8	9	6	6	3	2
18.00	3	3	3	5	6	7	5	8	8	5	4	4
16.00	21	18	16	22	20	8	9	8	6	7	3	2
17.00	6	13	14	7	22	6	7	6	6	7	3	2

TABLE 2:

The number of foraging and basking turtles, *Kachuga smithi* (Gray) observed at different hours during different months of the year, 1990.

Time (Hrs.)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
08.00	2	5	12	28	28	18	22	25	19	18	11	7
09.00	2	4	14	14	19	18	18	22	18	18	10	6
10.00	3	4	10	16	22	22	20	22	16	17	10	6
11.00	3	3	10	17	24	21	22	22	17	16	10	5
12.00	2	6	13	20	22	17	17	20	17	16	9	5
13.00	5	7	14	19	22	17	17	18	12	14	8	5
14.00	10	8	15	22	22	16	17	18	12	14	9	4
15.00	12	10	15	10	19	14	14	16	11	12	8	4
16.00	12	12	14	8	18	14	15	10	11	11	8	3
17.00	10	12	8	8	11	8	11	11	9	11	8	2
18.00	6	8	8	7	8	6	7	8	8	9	5	2

Acknowledgement

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Amphibian parasites of Mannampandal area, Nagapattinam district, Tamil nadu.

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Reptiles, birds and mammals sometimes depend on amphibians for their nutritional resources. It is a well known fact that the amphibians act as intermediate, complimentary or reservoir hosts for some of the helminths infecting domestic and wild animals (Prokopic and Krivane, 1975). The parasitic community forms an integral part of an ecosystem. It is superimposed upon free-living communities which form intermediate and definitive hosts (Kennedy, 1975). The spatial distribution together with the biocoenoses of the various amphibians has a bearing on the quantity and quality of the helminth fauna infecting these amphibians. Cross (1934) and Chappel (1969) reported that there is no doubt that in many cases the presence of one species of parasite in a host may affect the population of the latter. Hence Chubb (1973) stated that such a stress necessitates one to analyse the composition of the helminth fauna infecting the amphibian species. A perusal of the literature shows that no work has been attempted with regard to the amphibian helminths of Mannampandal area of Tamil Nadu. This study was undertaken to fulfill, to some extent, the lacuna in our knowledge of amphibian parasites locally.

Material and methods

Anurans such as *Rana tigerina, Rana cyanophlyctis, Bufo melanostictus* and *Polypedates maculatus* were collected from different localities in and around Mannampandal, situated 4 km away from Mayiladuturai, Nagapattinam district, Tamil Nadu. The animals were

transported to the laboratory, anesthetized with chloroform and dissected. The sex of the animal was noted. The different organs such as stomach, intestine, lungs, liver, spleen, kidney, testis/ovary were examined for the parasites. Most of the digenetic trematodes tracts were carefully examined for any small worms embedded in them. These parasites were removed and thoroughly cleaned of the debris sticking on to their surface.

The digenetic trematodes were transferred to glass slide and one or two drops of 10% formalin were added to them and then the specimens were covered with a glass slide. To secure the slides in position rubber band was placed one at each end of the glass slide. Later, the specimens were flattened by gently pressing the slides together. Then the flattened specimens were preserved in 10% formalin. The cestodes were also fixed in 10% formalin. The nematodes were fixed in glycerol-alcohol mixture. The number of parasites in each host was recoreded separately. The fixed helminths were dehydrated and stained with haematoxylin and mounted in DPX

Observation and Results

It is found that the digenetic trematodes infected only *R.tigerina* and *R. cyanophlyctis* with precentage of incidences, 56.8 and 71.8 respectively. On the other hand, *B.melanostictus* and *P.maculatus* were not infected with the digenetic trematodes (Fig.1). Cestode infection was not found in all the four species of amphibians. The nematode infection was observed in all the four host species. The rate of nematode infection was highest (100%) in *B.melanostictus* and *P.maculatus*. Higher rates of nematode incidence were found in *R. tigerina* and *R. cyanophlyctis*. It is very interesting to note that all the digenetic trematodes viz, *Pleurogenoides gastoporus, Tremiorchis ranarum, Ganeo tigrinum* and *Diplodiscus amphichrus* were found only in *R.tigerina* and *R. cyanophlyctis* (Table.1).

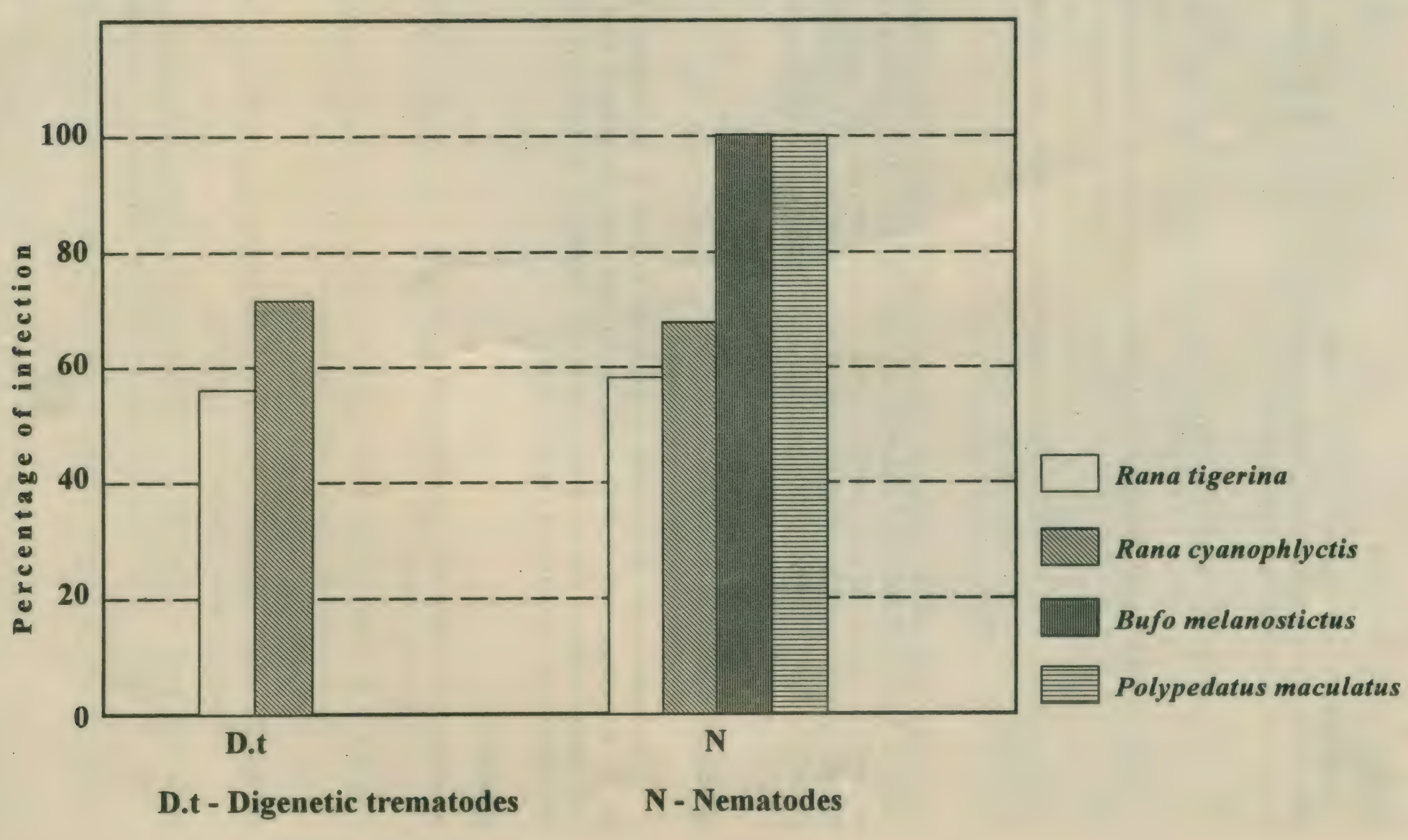
Discussions

It is observed that the aquatic amphibians viz, *R. tigerina* and *R. cyanophlyctis* were infected with digenetic trematodes. The terrestrial toad, *B. melanostictus* and the arboreal anuran, *P.maculatus* were not infected with digenetic trematodes. On the other hand, they were infected only with nematodes. These observations are in agreement with the reports of Looss (1894), Bychowsky (1933), Dubinina (1950), Volnna, (1974),

TABLE 1 : Intensity of parasitic infection in different species of anurans

Parasite	*Rana tigerina*			*Rana cyanophlyctis*			*Bufo melanostictus*			*Polypedatus maculatus*		
	No of animals Infected (%)	Total No of parasites	Intensity of parasitisation	No of animals Infected (%)	Total No of parasites	Intensity of parasitisation	No of animals Infected (%)	Total No of parasites	Intensity of parasitisation	No of animals Infected (%)	Total No of parasites	Intensity of parasitisation
A. Digenetic trematodes												
1. *Pleurogenoides gastroporus*	7 (15.9)	- 16	- 2.2	7 (21.8)	- 46	- 6.5	- -	- -	- -	- -	- -	- -
2. *Tremiorchis ranarum*	5 (11.3)	- 17	- 3.4	4 (12.5)	- 16	- 4.0	- -	- -	- -	- -	- -	- -
3. *Ganeo tigrinum*	13 (29.5)	- 24	- 1.8	12 (37.5)	- 50	- 4.1	- -	- -	- -	- -	- -	- -
4. *Diplodiscus amphichrus*	3 (6.8)	- 3	- 1.0	8 (25)	- 8	- 1.0	- -	- -	- -	- -	- -	- -
B. Nematodes												
1. *Fossocerca longicauda*	10 (22.7)	- 40	4.0 -	8 (25)	- 21	- 2.6	8 (36.3)	- 58	- 7.2	3 (7.5)	- 6	- 2.0
2. *Fossocerca ornata*	11 (25)	- 34	- 3.0	2 (6.2)	- 10	- 5.0	- -	- -	- -	- -	- -	- -
3. *Oswaldocruzia filiformis*	11 (25)	- 34	- 3.0	13 (40.6)	- 48	- 3.6	13 (59.09)	- 46	- 3.5	1 (2.5)	- 2	- 2.0

Fig. 1 Percentage of host species infected with digenetic trematodes and nematodes



Kozak (1969) and Vojtkova (1972). These authors have inferred that the hosts living in the aquatic environment are infected mainly with digenetic trematodes while those inhabiting the land are infected with nematodes.

Several authors have critically examined the host parasite specificity (Chubb, 1973; Kennedy, 1975; Prokopic and Krivanec, 1975). According to these authors it is in general, understood that every parasite has its own host species or a group of taxonomically or ecologically related species. The nematode *O. filiformis* is predominant in the terrestial amphibian *B. melanostictus*. It is also inferred in the present study that the digenetic trematodes infect only the aquatic amphibians viz, *R. tigerina* and *R. cyanophlyctis*, which are phylogenetically related.

This study clearly gives an idea that certain parasites infect hosts of specific habitat. It has been reported that phylogenetically related groups of hosts generally harbour helminth fauna of similar types (Peokopic and Krivanec, 1975). The relationships of the parasites to their hosts are primarily due to certain environmental requirements of these organisms (Vojtkova, 1972).

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Range extension of the Dumeril's black-headed snake *Sibynophis subpunctatus* (Dum & Bibr.,1854)

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Dumeril's black-headed Snake *Sibynophis subpunctatus* (Dum & Bibr.) has been recorded from the southern parts of India. This species has been also recorded up to Bhavnagar district of Gujarat State (Vyas,1986 & 1987).

On 19th June 1997, while demonstrating planting techniques before labourers and staff in Kamalnath Reserve Forest of Jhodol Tehsil of Udaipur district in Rajasthan, I saw a slender, brownish snake in a 50 cubic cm sized pit made for planting. Its head was of black colour with three white cross bars, confined to the black portion. The anterior two bars were broken in mid-dorsal region while the third one, which was bordering the black colured zone near the neck portion was unbroken. A row of black dots was also present on the mid-dorsal region,

The Kamalnath Reserve Forest is an undulating hilly area, presently with luxuriant growth of trees in scattered pockets. *Wrightia tinctoria, Butea monosperma, Madhuca indica, Terminalia bellerica, T. tomentosa. Diospyros melanoxylon* are common tree species in the area.

The presence of the *Sibynophis subpunctatus* in Udaipur district is an extension of its range further north than reported earlier. So far 22 species of snakes have been reported from Udaipur district (Sharma, 1997). Presence of *S.subpunctatus* is a new addition to the ophio-fauna of Udaipur as well as of Rajasthan state, hence it is worth recording.

Cobra, Vol. 32. 1998

Acknowledgement

I am grateful to Raju Vyas of Sayaji Baug Zoo Office, Vadodara (Gujarat) for identification of the snake.

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Unusual Marking Pattern in Krait *Bungarus sindanus*

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During the month of December, 1997, I received a colour photograph of a snake from Mr. I.R. Gadhavi, Sir P.P. Institute of Science, Bhavnagar for identification. The snake was collected by Mr. Bakulbhai Shukla, Bhavnagar from a new urban area of Bhavnagar city known as Kalavi Bid (old protected grass land of Maharaja, Bhavnagar State). After the documentation of photograph, the snake was released in Victoria park, a nearby protected forest. Mr. B. Shukla & family are running a voluntary 'Shukla Snake Service', SSS in Bhavnagar city. The members of SSS collected snakes from urban area of the city with a concept of conservation of the species and release them in a protected forest, away from human settlements (Gohil, 1983).

Description of the snake is as follows (on basis of colour photograph) : About half a meter long, dark steel black coloured snake with 35 white coloured oval shape circles, which form a long chain row, in place of thin white cross bands. Each circle has two to three white spots in the middle, on the dorsal vertebral hexagonal scales. The body markings faded on anterior 1/4th body-parts but posteriorly were bright and distinct, up to tail. The snake was identified as Sindh Krait (*Bungarus sindanus* Boulenger, 1897). Usually this species has a pair of thin white cross bands on body, which laterally widen and a vertebral spot (Smith, 1943). Here the white bands, laterally wider and anterior bands joined laterally with posterior bands to form white circles.

This kind of unusual body pattern of the snake is an exceptional case or a geographically distinct race? Before any assumption can be made it requires more number of the variant specimens from the area.

I thank Mr. I.R. Gadhavi, Bhavnagar for the information and photograph.

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Random Harvest

Lung power wins

Evolutionary theory predicts that changes in colour and appearance and the behaviour of the males during the breeding season have a relationship with the male's breeding quality, the superiority of a particular male in these respects over his peers being indicative of his genetic superiority.

Allison Welch and her colleagues at the University of Missouri have published a paper in *Science* on the grey tree frogs. Previous research had shown that females prefer males that make long calls to those that make short ones. Long calling uses a lot of energy, so it is a fair assumption that frogs which go in for it are the fittest of the fit. But Ms. Welch wanted to find out if this apparent fitness really reflects a frog's genes.

Ms. Welch stripped the eggs out of several females, divided each batch of eggs into two, and inseminated half with sperm from a long-calling male and half with sperm from a short-calling male. All the males chosen were of similar weight and health.

The result was 25 sets of half-siblings. By comparing the progress of tadpoles with different fathers but the same mother, the paternal genetic influence was easy to see. The offspring of the long-callers grew faster, metamorphosed from tadpoles into frogs earlier, and weighed more when they made their transition than the offspring of the short-callers.

(Source : *The Economist* 20 th Jan. 1998.)

Venom saves

The *National Geographic* of May 1998 carries a brief report on the studies done on snake venom in search of a drug that can prevent blood clots which sometimes trigger heart attacks. It has been known that venom of some snakes contains an anticoagulant. Robert Gould of Merck Research Laboratories has analysed the venom of eleven species of vipers and found proteins in their venom that keep human blood platelets from sticking together. Merck synthesized one of the proteins of the venom of saw-scaled viper and used the knowledge gained to design a drug called Aggrastat. " It may save thousands of lives a year".

- B. Vijayaraghavan.

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